I. C. 6958

September 1937

DEPARTMENT OF THE INTERIOR

UNITED STATES BUREAU OF MINES
JOHN W. FINCH, DIRECTOR

INFORMATION CIRCULAR

WHAT'S WRONG WITH MINE SAFETY PROGRAMS

BY

D. HARRINGTON

After this report has served your purpose and if you have no further need for it, please return it to the Bureau of Mines, using the official mailing label on the inside of the back cover.

I.C. 6958
September 1937

INFORMATION CIRCULAR

DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

WHAT'S WRONG WITH MINE SAFETY PROGRAMS[1]

By D. Harrington[2]

We Americans pride ourselves that ours is the greatest, most advanced and most civilized nation in the world, yet statistics indicate that apparently we have little appreciation for the lives and limbs of the people whose efforts give us whatever greatness we possess. The latest available statistics indicate that the annual accident death rate per 100,000 of population is nearly 80 or far higher than that of any other country in the world except Chile; is more than double the rate in Hungary, Netherlands, Ireland, Belgium, Denmark, Italy, Germany, Norway, Sweden, and Finland; is nearly double that of England, Wales, the Union of South Africa, New Zealand, Japan, Australia, and Scotland; and is 25 to 40 percent greater than Switzerland, France and Canada. To make matters worse, from the viewpoint of mining, the latest available statistics give mining by all adds the worst accident rate of the major industrial occupations in the United States, the accident severity rate for mining in 1935 being listed by the National Safety Council as 10.14, the next highest rate being 4.52 for construction, and the average rate for 30 main industries being 1.58.

IMPROVEMENT IN SAFETY RECORDS

Offsetting to a slight extent this rather dark picture is the fact that starting about 1930 the mine-accident rate in both coal and metal mining began to fall, reaching an all-time "low" in metal mining in 1932 and in coal mining in 1933. It now appears probable that the year 1936 has again lowered the accident rate in coal mining and this, together with the fact that the years 1933, 1934, 1935, and 1936 all set much lower accident rates in coal mining than were achieved for any similar previous period, gives hope that the trend is definitely in the right direction, though from the above figures mine-accident severity has a long, tedious road to travel before it becomes as low as the severity rate of all other major industries in the United States.

---

[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6958."
Reprinted from the Mining Congress Journal, April 1937 (vol. 23, no. 4, pp. 18-31).

[2] Chief, Health and Safety Branch, U. S. Bureau of Mines, Washington, D. C.

Fatalists who believe that mining is so inherently unsafe that it can't be made safe, that "what is to be will be" and that it is waste effort to try to take preventive measures, as well as other pessimistic followers of the idea that mining must always occupy the booby place in accident prevention, might "get away" with their do-nothing or stand-pat attitude if it were not for the fact that there are scores of well-authenticated instances of long-time operation of mines, coal as well as noncoal, with accident occurrence (including severity as well as frequency rates) little if any poorer than those attained by other so-called hazardous industrial pursuits. We now know of scores of mines, surface and underground, coal and noncoal, that have operated 1 or more years without a single lost-time accident; of scores of mines of practically all types that have operated for several years and produced heavy tonnages of coal or rock without a fatality; of underground workers who have escaped accidents in 30, 40, 50 or more years of work in and around mines, coal as well as noncoal; of mines which by really well directed effort have reduced accident occurrence, including not only frequency and severity but also the dollars-and-cents costs of accidents, 75 to 90 or more percent in less than a 5-year period; in fact we know beyond the shadow of a doubt that mines can be operated with a high degree of safety, provided the will to do it plus the exercise of the required amount of continued, well-directed effort is made by those engaged in mining, with particular reference to those in supervisory and ownership positions.

RESPONSIBILITY FOR ACCIDENTS

Responsibility for accidents in and around mines rests primarily on the owner or operator; this is true not only from the humanitarian, but to even a larger extent, from the legal point of view. The various State laws require the industrial organization (the mine operator in this case) to compensate the accident victim or his dependents as well as to provide largely if not wholly for medical aid, hospitalization, and in some cases funeral charges; those financial outlays constitute the so-called direct cost of accidents. Of course, the indirect costs (said by some authorities to be at least four times as great as the direct costs) rest almost wholly on the employer. The combined direct and indirect costs of accident occurrence in mining are now believed to amount to 10 or more percent of the cost of mining, and by a reasonable amount of well-directed, consistently applied effort, chiefly by and through the employer and his agents, this cost can readily be reduced by 75 or more percent. Admittedly the responsibility for accident occurrence as well as for engineering and administrative measures for its reduction is a most difficult one for the mine operator. Fulfillment of the obligation to hold accident occurrence to a minimum requires utmost tact, ingenuity, and persistence on the part of the mine officials, necessitating direction and control over numerous conditions and agencies susceptible of such direction and control by use of the highest type of technical knowledge and experience plus a continuous broad-gauge policy of dealing with men.

Original from THE OHIO STATE UNIVERSITY

NEED FOR ACTIVE INTEREST OF EXECUTIVES

Probably the worst handicap today to getting effective results in the prevention of accidents in mines is the difficulty of enlisting the active personal interest of the "men higher up" in the prevention of accidents; and unless or until the "higher-ups" become sincerely interested and personally active in promoting safety in mining our mine-safety achievements are likely to make little progress. If the operating heads, including president, general manager, general superintendent, and superintendent, devote a reasonable amount of personal time and sincere, common-sense effort toward promoting safety, the "job" of the lower mining officials, including the safety man or men, in "putting over" safety requirements is aided very greatly. On the other hand, the very worst influence to be found in trying to "put across" a mine safety program is the higher official (president, vice president, general manager, etc.) who "once in a blue moon" attends a safety meeting and then proceeds to lambast his employees about some controversial subject, alined to safety indirectly if at all, such as hours of work, wage rates, cleaning coal, etc. Management now pays most of the bill for accidents; nevertheless, the worker usually not only endures the pain and kindred handicaps and sorrows but also in the long run suffers far more financial loss than is usually believed; and the wise, up-to-date management (as individual members or as a whole) can do far more than any other agency in forwarding safety. Without sincere interest and support from management the work of subordinate officials (including the safety engineer) is sadly handicapped and in many cases made essentially useless in progress or accomplishment.

Certainly the managerial force of any mining property cannot expect to "get anywhere" with a new or even partly new safety program unless it puts its own house in order before trying to introduce changes, even those looking to greater safety, that affect to any considerable extent the employees' usual routine. Before trying to place a comprehensive safety program in effect a wise, far-seeing mine management will demonstrate its own sincerity by exerting a reasonable amount of effort to make operating conditions, equipment, and methods, such that when pressure is put on the workers later to conform to innovations essential to making the proposed safety program effective, it can point with pride to the time, money, and effort already expended to do its part toward consummation of the new program. As a minimum, haulage roads should be cleared of debris of all kinds, including piles of ties, props, rails, or other material; a reasonable clearance should be established between motive equipment and projections on haulage roads or at any rate on main haulage-ways; haulage roads should be thoroughly protected by timbering; mine cars, mining machines, and all other underground machinery and equipment should be kept in good repair and thoroughly guarded and kept that way; coal mines should be thoroughly rock-dusted; water should be supplied the workers to be used on mining and drilling machines and on loading machines and on the face region to reduce dust in coal or metal mines; up-to-date electric cap lamps should be supplied all workers to give them the best and safest available lighting system to enable them to work with maximum safety and efficiency; all mines should be well-ventilated, especially in the face region; a suitable timbering system should be installed and ample timber and timbering supplied; and an adequate, experienced, competent supervisory force should be provided. These and other phases of good housekeeping and good management should be in thorough effect before the mine operating organization makes any determined effort to "put over" its safety campaign in connection with the workers. Far too frequently the management inaugurates a more or less revolutionary safety campaign by throwing essentially the entire change in procedure on the workers, with very little if any expenditure of effort, time, or money by the company; the workers quickly sense the significance of such a situation and question the sincerity of the employer, with the result that the proposed program is doomed to failure. The mining employer must do his part to a far greater extent in the future than in the past if the stigma of having the worst accident record of the major industries is to be removed from mining; and even if one disregards the humanitarian features altogether surely no efficient mining executive can fail to be actively interested in trying to make material reductions in a cost, particularly if it can be shown that exercise of a reasonable amount of earnest effort on his part can reduce this cost 75 or more percent.

Once the operating company has tried to put its house in order by making mining conditions (methods, equipment, supervision, etc.) such that the worker really has a chance to work safely if he will do his share, the most difficult part of the problem confronts the managerial forces, namely education of the workers. This is a real job, by far the most difficult and at the same time the most important one, in trying to make the worker "safety conscious" as regards present-day mining conditions and practices. Protests by management that this educational work is not a legitimate function of the operation of a mine and that the worker should at least protect himself are futile because the unduly high rate of accident occurrence in our mines proves that the average mine worker has no adequate conception of what to do for his own protection, to say nothing of the obligation as to safety he owes to his fellow worker and to the mine as a whole, moreover, as has been indicated, the law, as well as public opinion, holds the operator responsible for accident occurrence in and around mines; therefore, whether or not a mine operator likes it, if he does his job well, he and his operating officials must be educators, at least insofar as safety is concerned. All mine officials should be well-grounded in safety; otherwise, the so-called educational work they do may result in decreased rather than increased safety. The first and most important educational job of the company is thus to take measures to inform its own mine officials upon up-to-date mine-safety procedure, and this presupposes the existence of some form of mine-safety organization. The safety organization should be one that is kept actually and actively functioning, preferably with the operating heads of the mine, the division, or the company taking the lead and being present at many if not all meetings, to be held at least once a month. All of the bosses and the workers, preferably through committees, should participate. The safety organization should discuss and determine safety policies, and one very important feature should be the investigation of conditions surrounding all accidents and discussion by the safety organization of proper procedure to eliminate similar accidents in future.

CENTRALIZING RESPONSIBILITY IN ONE PERSON

If safety is to be given the attention it deserves, its handling should not be entrusted to every Tom, Dick, and Harry in the organization because what is everybody's business is usually nobody's business. In other words, some one person should be in charge of safety. This is done only in relatively few of our mines, especially the smaller ones. In a relatively large property (say with 100 or more employees) at least one full-time safety man should be employed. If he is even fairly efficient his cost cannot be charged to "dead work" as he can save his salary and attendant expenses several times over. In small properties the "heading-up" of the safety work may well be delegated to the mine foreman if he is of the right type and is not already overloaded with work, or it may be placed in the hands of some wide-awake (preferably technically trained) boss who has had considerable experience in mining, knows safety work at least fairly well, and reads enough current mining literature to keep himself at least fairly well informed not only upon safety but on efficiency in mining as well.

It is high time that the safety man be given more adequate recognition as an important cog in mining; for years (even up to the present) he has been looked upon as a more or less necessary nuisance and the less ability he had and the least heard from or of him the better. With the advent of high compensation costs (and unit compensation payments, hence ultimate compensation costs are far more likely to increase than to decrease, therefore prevention of accidents is the employer's main protection against high cost of compensation) the efficient safety man has a place of economic value and service to his employer second to no other unit of the operating organization, though few if any mining organizations recognize this. Today's safety man must be primarily an educator and preferably should be technically trained (though many very efficient safety men are not); he should have had several years of experience in mining and certainly should not be a youngster just out of school; he should be physically capable of making thorough, rigid underground inspections, not some superannuated official for whom the company is under obligation to provide; and above all he should know how to get along with men, including the mine bosses as well as the mine workers in general. If he is to be even moderately effective in his work he should have operating authority, though he should exercise that authority as rarely as possible. If at all feasible he should be essentially an assistant superintendent, or possibly assistant to the superintendent or the general manager; at any rate he should have direct contact with the high officials. His usefulness is likely to be lessened materially if he is forced to be under the control and direction of local mine officials, though he will be almost useless unless he has the ability to work with them. Before the mine accident rate can be forced down there will have to be more and better safety engineers and their work will have to be given much more consideration than has been the case up to and including the present time.

REDUCTION IN NUMBER OF DISASTERS

The hard-boiled old timer steeped in the traditions of the past who has always believed that, so long as mines are worked, accidents are certain to occur, is difficult to convince that individual coal and noncoal mines, both surface and underground can be worked a year or more without a lost-time accident, yet this has been done in scores of instances; to try to convince this type of man that mine accident reduction of 50 or more percent on a nationwide basis is possible, is a large order. Yet this degree of accident reduction has already actually been accomplished on a nationwide basis in connection with what was considered the least feasible of mine accidents to control or conquer, namely fire and explosion disasters in coal mining. For the past 4 years, the coal mines of the United States have had 12 major fire and explosion disasters (a major disaster being one with 5 or more deaths), and in these 12 major disasters there were 101 fatalities. In the 4-year period 1911-14 inclusive (or the 4 years immediately after the United States Bureau of Mines was established by Congress, largely with a mandate to try to aid in eliminating or at least reducing mine disasters) there were 47 major coal-mine disasters, total fatalities from them being 1,447. From this it will be seen that in reducing major disasters from 47 in the 4 years 1911-14 inclusive to 12 in the past 4 years (1933-36, inclusive) the number of major disasters was reduced about 75 percent and the number of fatalities was reduced from 1447 to 101 or practically 93 percent. True the elapsed period during which this vast improvement was made was more than 20 years; it is also true that at one time the defeatist saying "it can't be done" was peculiarly applicable to any attempt to eliminate mine disasters, yet today we have good reason to think that it can and will be done. In any event, a long step has been taken toward consummation of the desired result, if the record of the past 4 years can be accepted as any criterion by which to judge.

IMPORTANCE OF REDUCING ACCIDENTS

By no means as much progress has been made in reducing other types of mine accidents as in connection with disasters (and here it may be well to state that metal mining as well as coal mining has done a good "job" in the reduction of disasters in the past several years, though there were 2 in 1936 with a total of 16 killed). Accidents due to falls of men and material, to haulage, to explosives, to electricity, and to miscellaneous causes have not been reduced nearly in proportion to the reduction accomplished in connection with disasters; here is a man-sized job for our mining people to undertake and to do as well with it as they have done with disasters; and, as with disasters, it can be done!

Falls of Men and Materials

Falls of men and material continue to take about 50 percent of the lives annually lost in our mines (coal or metal) and this kind of accident is now and has been one of the most difficult to prevent. However, it is significant that in mines with the poorest or worst overhead or roof conditions (coal and noncoal as well) accidents from roof falls are almost non-existent, because under such circumstances the hazard is usually recognized and ample provision taken through changes in the mining system, more intensive supervision, or possibly increased attention to timbering and other roof-supporting practices, or perhaps all of these influences as well as others accomplish the result. This fact that often mines with very bad roof conditions have good safety records indicates that if all mines, including those with so-called or supposedly good roof, were required to take the precautions which are now in self defense forced upon the mines that have known poor roof conditions, accidents from falling overhead material as well as probably from other causes would soon approach the disappearing stage, just as have fatalities from disasters.

Numerous instances are at hand indicating that this roof-fall problem is by no means beyond at least limited control, and while most of them are individual mines or mining companies, one very encouraging example is at hand in which mines of an entire State, by prosecuting a determined, persistent campaign against roof fall accidents, within a very few years reduced these accidents around 50 percent and thereafter held them within the reduced number and rate.

Probably the greatest advance toward solution of this problem of roof-fall accidents would be recognition by mining people that at least 95 times out of 100 there is "no such animal" as good roof and that to be safe, all underground roof should be amply supported. The mine with the supposedly good roof, which has now an advantage over its neighbor with the poorer roof, would lose that advantage if the above concept were accepted. However, far too often the supposedly good roof drops workers beneath, frequently with fatal results (and the "good-roof" mine must pay the expenses of the accident). It is therefore possible, even probable, that in the long run, if the fact is recognized that there is "no such animal" as good roof and steps are taken to support all roof, the net result would be a dollars-and-cents saving to the coal industry and material abatement of accidents from roof falls.

While the owner-operator-management responsibility as to the effect of mining methods and equipment in connection with prevention of roof-fall accidents is almost predominent, the less controllable factor of human or personal action or inaction of the individual worker is but little less one that depends largely on the management. First of all, it should be recognized that irrespective of age, experience, or other attribute, the mine worker is by inheritance and long-established habit a taker of chances, and the management is confronted with the "job" of

Original from THE OHIO STATE UNIVERSITY

of educating these very understandable habits out of the worker or of surrounding him with sufficient rigid supervision to protect him in spite of himself. Many people believe that this is a "job" which should not devolve upon the management, but unless management shoulders the burden and does so efficiently, it is certain to pay plenty, not only in dollars and cents because of the high-severity type of accidents which usually accompany roof falls but also in numerous indirect costs, among them loss of or failure to achieve public support.

Haulage Accidents

Haulage accidents in mines, like the traffic problem on our streets and highways, constitute a decidedly knotty problem and also an important one, inasmuch as about one-fifth of all mine fatalities in some manner or other come from haulage. The haulage problem in mining, however, should be (in fact, it is) much more readily susceptible of solution than the surface traffic problem, inasmuch as the mine management, even in these days, has a much better opportunity than do surface traffic officials to educate workers as to safe haulage practices and to supervise them and their activities and enforce rules and regulations. Moreover, the main element in connection with the prevention of haulage accidents lies wholly within the province of the mine operator, namely the installation and maintenance of safe haulage systems, including hoisting engines, ropes, shafts, trackage, cars, locomotives, and methods of maintenance and use, etc.; and especially in providing ample clearance along haulage roads and well aligned and graded tracks throughout the mine.

As with roof-fall accidents, the personal equation in connection with prevention of haulage accidents gives management a severe problem, which must be shouldered by the supervisory forces and solved through a combination of education and supervision, by no means an easy task as the type of person necessary to do a good job in mine haulage work is likely to be more inherently a "chance taker" than is any other type of worker in mines unless possibly the shot firer in coal mining.

Accidents from Explosives

Normally accidents from explosives (blasting), from electricity, from machinery, and from other miscellaneous causes aggregate but about 15 percent of the total accidents in our mines, but relaxations or neglect in connection with explosives practice as well as with electricity in mines are very easily capable of causing disasters, such as fires or explosions in both coal and noncoal mines, even one of which might very readily cause fatalities to mount so high as entirely to disrupt the good records of mine-accident occurrence established in late years. A volume could readily be written on the influences of various kinds exerted by explosives, electricity, or machinery on mine accident occurrence. All of the conditions in connection with the use of electricity, explosives, machinery, etc., in our mines are under the control of the operating company, and the handling of the personal

Original from THE OHIO STATE UNIVERSITY

equation is here again the problem of management, with education and supervision the main essentials.

CONCLUSIONS

"What's Wrong with Mine Safety Programs" can be very easily answered, though application of the remedy is by no means so apparent. If all of the mines of the United States were as earnest and efficient in the prevention of accidents as a few (possibly 10 percent of them) are, accidents in the mines of the United States could readily be reduced 90 percent. There isn't a single main cause of mine accidents (falls of roof or of men, haulage, explosions and fires, electricity, explosives, machinery) that hasn't been met squarely and essentially solved by several mines or mining companies in the United States; but unfortunately many mines effectively handle the problem of accident prevention in one or possibly a few of the main causes of accident occurrence and fail to extend the efforts far enough to cover the others. When every mine management becomes fully aware of the fundamental importance of accident prevention not only from the humanitarian but also from the more practical dollars-and-cents point of view and, divests itself of the fatalistic idea that accidents are going to happen anyway, and becomes willing to give to safety the same personal attention now paid to taxes, wage rates, selling prices, etc., then (and probably not until then) will mine accident programs function effectively and to the ultimate benefit of the worker, the owner or operator, and the general public. Until such time as management can be induced to give its wholehearted backing to prevent accidents, the present program will probably "carry on" with its slow but fairly steady progress, in which a relatively small proportion of mine management really does its share and the safety men employed by mining and other organizations, the relatively few State and Federal employees engaged in mine safety work, and the workers themselves carry the burden and do at least a fair job; but essentially nothing is accomplished in accident prevention in mining compared to what could be done if management would put its shoulder to the wheel in a really effective manner in trying to reduce accidents in the mining and allied industries of the United States.